

A revision of the *Lasiopetalum floribundum* group (Malvaceae), including recognition of four new species

Kelly A. Shepherd^{1,2,3} and Carolyn F. Wilkins^{1,2}

¹Western Australian Herbarium, Department of Biodiversity, Conservation and Attractions, Locked Bag 104, Bentley Delivery Centre, Western Australia 6983

²School of Plant Biology, Faculty of Science, The University of Western Australia, 35 Stirling Highway, Crawley, Western Australia 6009

³Corresponding author, email: Kelly.Shepherd@dbca.wa.gov.au

Abstract

Shepherd, K.A. & Wilkins, C.F. A revision of the *Lasiopetalum floribundum* group (Malvaceae), including recognition of four new species. *Nuytsia* 28: 273–298 (2017). This revision focuses on *Lasiopetalum floribundum* Benth. and six morphologically allied Western Australian species. This group is characterised by loose dichasial or monochasial inflorescences comprising small, pink or white flowers subtended by a narrow, non-petaloid, epicalyx bract and having reflexed, stellate hairs on the style. Three new species of conservation significance from east and north of Perth are named as *L. caroliae* K.A. Sheph., *L. rutilans* K.A. Sheph. & C.F. Wilkins and *L. moulleian* K.A. Sheph. & C.F. Wilkins, and a new species from the Margaret River region, *L. occidentale* K.A. Sheph. & C.F. Wilkins, is also recognised. Revised descriptions are provided for *L. floribundum* (which is lectotypified), *L. glabratum* Paust and the Threatened species *L. pterocarpum* E.M. Benn. & K.A. Sheph. A key to the group is included along with images and distribution maps.

Introduction

Lasiopetalum Sm. is an endemic Australian genus in the tribe *Lasiopetaleae* J. Gay (subf. *Byttnerioideae* Burnett, Malvaceae Juss.) (Stevens 2001; Whitlock *et al.* 2001; Bayer & Kubitski 2002) characterised by a lack of stipules, a lack of prominent ribs on the petaloid calyx, petals being either absent or reduced to scales, and poricidal anther dehiscence (Grieve 1998; Wilkins & Whitlock 2015). Largely confined to southern Australia, the genus extends northward to Shark Bay on the west coast and to the Blackdown Tableland in Queensland.

Lasiopetalum has not been revised in full since Bentham's treatment in *Flora Australiensis* (1863), although in recent decades 12 new species have been described (Paust 1974; Shepherd *et al.* 2006; Bennett & Shepherd 2007; Meissner *et al.* 2014), and *L. laxiflorum* (Benth.) F. Muell. and *L. glutinosum* (Lindl.) F. Muell. have been reinstated (Shepherd & Wilkins 2015). This brings the total number of formally described species in the genus to 35; however, there remain at least 12 potentially new taxa that require taxonomic resolution, many of which are of conservation concern (Western Australian Herbarium 1998–; CHAH 2006–).

Following a revision of the rostrate anther group of *Lasiopetalum* (Shepherd & Wilkins 2015), this paper is one in a series that will serve to name and revise species in Western Australia, initially focusing on taxa that were previously included in *Lasiopetalum* sect. *Corethrostylis* (Endl.) Benth. (basionym *Corethrostylis* Endl.). The section *Corethrostylis* was originally distinguished by the presence of stalked and reflexed stellate hairs that form a dense, white, ‘cylindrical or conical mass’ along the length of the style (Bentham 1863); however, it is evident that this character is variable and as such the section is no longer accepted. This account focuses on *L. floribundum* Benth. and six allied species (the *L. floribundum* group).

Methods

The methods for examining specimens and mapping follow Shepherd and Wilkins (2015). Stellate hairs in the *L. floribundum* group fall into two categories, those with the arms fused such that the hair is scale-like (Figure 1A) and those with free arms (Figure 1B). The radiation of the free arms may be multiangulate (in all directions) or rotate (in one plane), as defined and illustrated in Hewson (1988: 18, Figure 3K). In the following descriptions, stellate hairs have multiangulate arms unless otherwise stated. Indumentum density is defined here as ‘tomentose’ when the hairs are very densely arranged and the epidermis obscured, ‘dense’ when hairs are overlapping but the epidermis is visible, ‘moderately dense’ when hairs are touching laterally, and ‘scattered’ when the hairs are well-separated. Scanning Electron Microscope (SEM) images were produced using a Jeol Neoscope JCM 5000 bench top machine with material coated in gold using a Smart-Coater. Images of type material were viewed via *Global Plants* (<https://plants.jstor.org/>).

Taxonomy

The *L. floribundum* group of species share the following combination of characters: *leaves* ovate to broadly ovate or orbicular, with the base cordate; *stipules* absent; *inflorescence* a loose monochasial or dichasial cyme; *epicalyx bract* single, non-petaloid, linear to narrowly oblong; *calyx* pale to bright pink (rarely white) without prominent ribs, with the inner surface dark red at base, or green and dark red; *petals* absent; *anthers* 5, deep red, glabrous, ovate to elliptic with an obtuse apex with introrse dehiscence of white pollen from apical pores; *ovary* 3-carpellate with two ovules per carpel; *style* filiform with a cone of dense, white, fan shaped, reflexed, stellate hairs along most of its length.

Key to species in the *Lasiopetalum floribundum* group

1. Margin of mature leaves multilobed, abaxial surface with a tomentum of stellate hairs; ovary and fruit winged between carpel fusion lines (Serpentine National Park)..... **L. pterocarpum**
- 1: Margin of mature leaves entire, irregular or trilobed (rarely multilobed), abaxial surface with scattered to dense stellate hairs; ovary and fruit without wings
 2. Procumbent, trailing subshrub; stem, inflorescence and outer calyx indumentum of scale-like hairs with some stellate hairs; mature leaf blades usually <4 mm long, orbicular to broadly ovate, apex rounded (Bindoon to Toodyay; NE of North Bannister)..... **L. caroliae**
 - 2: Erect subshrub to shrub; stem, inflorescence and outer calyx indumentum of multiangulate stellate hairs only; mature leaf blades usually >4 mm long, broadly ovate to narrowly ovate, apex acute to acuminate
 3. Mature leaves coriaceous and stiff; abaxial leaf surface glabrous or with scattered, stellate hairs on veins, each with arms to 0.3 mm long (Bullsbrook to North Bannister)..... **L. glabratum**

- 3: Mature leaves soft and pliable; abaxial leaf surface with a scattered to moderately dense indumentum of stellate hairs, each with arms 0.6–0.8 mm long
4. Pale brown, golden or ferruginous (rarely purple-red), stellate hairs present on new growth of the stem, pedicels and peduncle; calyx lobes 0.7–1.1 mm wide, base dark red
5. Mature leaves entire, multilobed or sinuate; inflorescence usually with ≥ 10 flowers per inflorescence (Bullsbrook to Walpole and E to Boat Harbour)..... **L. floribundum**
- 5: Mature leaves always distinctly trilobed; inflorescence always with < 10 flowers (Margaret River region)..... **L. occidentale**
- 4: Bright red, stellate hairs evident on new growth of the stem, pedicels and peduncle; calyx lobes 1.4–2.3 mm wide, base dark red with green at junction of lobes
6. Abaxial leaf surface with two layers of stellate hairs (large and small); calyx lobes 1.4–1.7 mm wide, inner surface with stellate hairs; aril a cream-brown cap with 2–5 arms, 1.6–2.3 mm long (Kellerberrin–Kwoylin area)..... **L. mouleian**
- 6: Abaxial leaf surface with one layer of large stellate hairs; calyx lobes (1.7–)2–2.8 mm wide, inner surface glabrous; aril a white cap with 2 arms, c. 1.3 mm long (Mt Lesueur area) **L. rutilans**

Lasiopetalum caroliae K.A.Sheph., *sp. nov.*

Type: Bindoon Training Area, Western Australia [precise locality withheld for conservation reasons], 1 November 2005, *F. Hort* FH 2668 (*holo:* PERTH 07308264; *iso:* CANB, K, MEL).

Lasiopetalum sp. Toodyay (F. Hort 2689), Western Australian Herbarium, in *FloraBase*, <https://florabase.dpaw.wa.gov.au> [accessed 30 August 2016].

Lasiopetalum exiguum E.M.Benn. & K.A.Sheph. ms, Western Australian Herbarium, in *FloraBase*, <https://florabase.dpaw.wa.gov.au> [accessed 30 August 2016]; G. Paczkowska & A.R. Chapman, *West. Austral. Fl.: Descr. Cat.* p. 543 (2000), *nom. inval.*

Procumbent, sprawling *subshrub*, 0.08–0.4 m high, 0.15–0.2 m wide, with some trailing stems up to 1.45 m long. *Young stems* densely hairy to tomentose, with occasional to scattered, off-white or pale tan, \pm rotate and multiangulate stellate hairs with 6–8 arms, each to 1–2 mm long, over dense, white with pale tan-centred, scale-like, stellate hairs with 10–22 fused arms, each to 0.2 mm long, glandular hairs absent or occasional to 0.8 mm long; mature stems red-brown, glabrescent. *Petioles* 0.4–2.5(–7.8) mm long, indumentum as for young stems. *Mature leaf blades* scarcely coriaceous, orbicular to broadly ovate, scarcely discolorous, (0.8–)1.5–4(–6) mm long, (0.8–)1.7–4.5(–6) mm wide, base strongly cordate, apex rounded; margins entire, flat or scarcely recurved; abaxial surface glabrous or with scattered, white with pale brown-centred, stellate hairs with 5–7 arms, each to 0.5 mm long; adaxial surface glabrous or with scattered, white with pale tan-centred, stellate hairs with 6–10 arms, each to 0.8 mm long, glandular hairs absent, glabrescent. *Inflorescence* a loose monochasium or dichasium, 21–85 mm long, with (4–)6–8(–13) flowers; *peduncles* (8–)23–33 mm long, with or without occasional stellate hairs with c. 6 arms, each to 0.7 mm long, over scattered to dense, scale-like, stellate hairs with c. 20 arms, each to 0.1 mm long and occasional multicelled, glandular hairs to 2.1 mm long. *Pedicels* 0.8–3.5 mm long, indumentum as for peduncles. *Bract* oblong or narrowly obovate, (0.3–)0.9–1.3 mm long, 0.15–0.5 mm wide. *Epicalyx bract* attachment at base of the calyx (0.5–1 mm below), green or dark red, oblong, narrowly oblong or filiform, 0.6–0.8 mm long, 0.1–0.2 mm wide; abaxial and adaxial surface with white, apical, stellate hairs with 6–20 arms, each

to 0.8 mm long, and occasional scale-like, stellate hairs 0.15 mm diam. *Calyx* pale to bright mauve-pink, base dark red, 3.6–5.7 mm long with a tube 0.5–0.6 mm long; lobes narrowly ovate or narrowly elliptic, 3–5.7 mm long, 0.7–2.3 mm wide, apex acute; outer surface with dense, white, scale-like, stellate hairs with 8–12 fused arms, each to 0.2 mm long, and scattered to moderately dense, white, glandular hairs to 0.3 mm long; inner surface glabrous or with scattered, white, stellate hairs with 1–6 arms, each to 0.15 mm long. *Staminal filaments* 0.2–0.3 mm long, 0.2 mm wide. *Anthers* ovate, red-purple, 1.4–2.3 mm long, 0.6–0.8 mm wide. *Ovary* 0.8–1 mm long, 0.8–1 mm wide; outer surface with dense, white, stellate hairs to 0.3 mm long. *Style* 2.8–3.5 mm long. *Fruit* ellipsoid, 4.1–4.5 long, 4.2–4.5 mm wide, with moderately dense, white, stellate hairs throughout, glandular hairs absent. *Seed* ellipsoid, dull, brownish black, 1.9–2.2 mm long, 0.9–1 mm wide, covered in scattered, white, stellate hairs; aril a cream cap with two short arms, 0.7 mm long, c. 1.1 mm wide. (Figures 1A, 2)

Diagnostic features. *Lasiopetalum caroliae* is distinguished from morphologically similar species by the following combination of characters: a delicate, straggling habit; small, orbicular to broadly ovate mature leaves usually <4 mm long, with a rounded apex; scale-like, stellate hairs on the stem, pedicels, peduncle and outer surface of calyx (Figure 1A).

Selected specimens examined. WESTERNAUSTRALIA: [localities withheld for conservation reasons] 23 Sep. 1987, *Anon. s.n.* (PERTH 02714957); 26 Sep. 2007, *E. Bennett* 37 (PERTH); 3 Dec. 2008, *A. Crawford* 1909 (K, PERTH); 10 Oct. 2012, *S.A. Dalglish & J.M. Collins* ELA 2 (PERTH); 1 Oct. 2001, *M. Hislop* 2327 (AD, CANB, PERTH); 6 Apr. 2005, *F. & A. Hort, A. Reavely & N. Willers* 2512 (PERTH); 13 Oct. 2005, *F. B. & J. Hort* 2634 (PERTH); *F. & B. Hort* 2678 (PERTH); 6 Nov. 2005, *F. & J. Hort* 2682 (PERTH); 9 Nov. 2005, *F. Hort* 2689 (PERTH); 27 Sep. 2000, *G.J. Keighery & N. Gibson* 2917 (PERTH); 25 Aug. 2016, *K.A. Shepherd & C.F. Wilkins* KAS 1618 (CANB; PERTH); 24 Feb. 2006, *C.F. Wilkins & F. & J. Hort* CW 2156 (PERTH).

Phenology. Flowering from September to November. Fruits observed on specimens collected in December.

Distribution and habitat. *Lasiopetalum caroliae* is restricted to a few, scattered populations around Bindoon and Toodyay, in the Wearne State Forest, and north-east of North Bannister (Figure 3) in the Swan Coastal Plain and Jarrah Forest bioregions (IBRA7; Department of the Environment 2013). This species is often found mid-slope on yellow-brown, sandy loam and lateritic gravel soils in *Eucalyptus accedens* woodland or in patches of scrubland or heath.

Conservation status. Listed as Priority Three under Department of Parks and Wildlife Conservation Codes for Western Australian Flora by Smith (2017), under the name *L. sp.* Toodyay (F. Hort 2689). While regionally restricted, this species has been recorded as being abundant in some populations.

Etymology. This species is named in honour of Dr Carolyn (Carol) Wilkins (1945–), friend and colleague of the first author, in recognition of her indefatigable energy and enthusiasm, which has been particularly valued during many long days shared in the field. Carol has also made a significant contribution to Australian plant taxonomy in the last 20 years having named or revised more than 90 taxa in the *Lasiopetaleae* (Malvaceae) (Meissner *et al.* 2014; Shepherd *et al.* 2006; Shepherd & Wilkins 2015; Whitlock *et al.* 2011; Wilkins 1999, 2005; Wilkins & Chappill 2001a, 2001b, 2002a, 2002b, 2003; Wilkins *et al.* 2008; Wilkins & Whitlock 2005, 2009, 2011a, 2011b, 2015) and various Fabaceae genera (Chappill *et al.* 2007, 2008; Wilkins & Chappill 2007a, 2007b, 2007c; Wilkins *et al.* 2009; Wilkins, Ladd *et al.* 2009; Wilkins *et al.* 2010; Wilkins & Trudgen 2012).

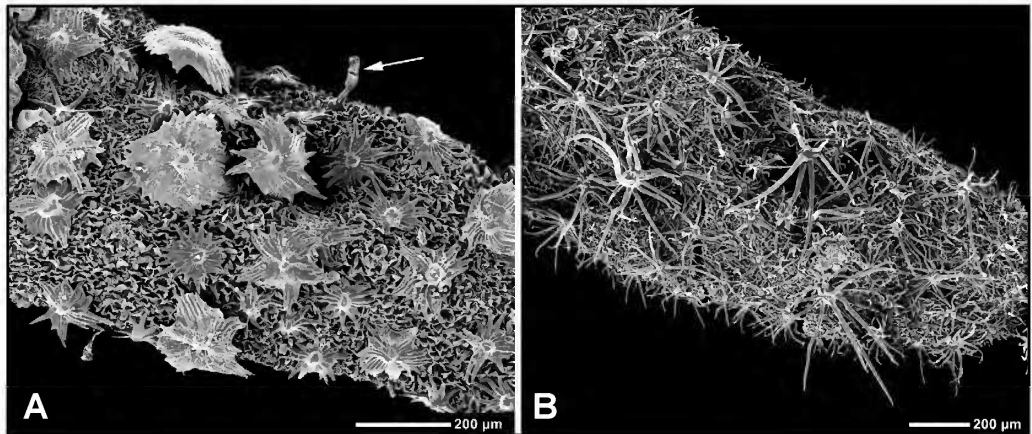


Figure 1. Petiole indumentum. A – *Lasiopetalum caroliae*, showing the distinctive scale-like hairs and scattered glandular hairs (white arrow); B – *L. floribundum*, showing large, scattered, sessile or stalked, stellate hairs over smaller, sessile, stellate hairs. Scale bars = 200 µm. Images by K.A. Shepherd from *G.J. Keighery & N. Gibson* 2917 (A) and *C.F. Wilkins & B. Vincent* CW 2097 (B).



Figure 2. *Lasiopetalum caroliae*. A – Dr Carol Wilkins holding the species named in her honour; B – habit; C – dichasial inflorescences; D – flowers, showing red peduncle and pedicel, narrow, pink, petaloid calyx lobes with a deep red base, deep purple anthers, and dense, white, reflexed, stellate hairs along the length of the style. Vouchers: *K.A. Shepherd & C.F. Wilkins* KS 1618 (B); *F. Hort & B. Hort* 2678 (C, D). Photographs by K.A. Shepherd (A), C.F. Wilkins (B) and F. and J. Hort (C, D).

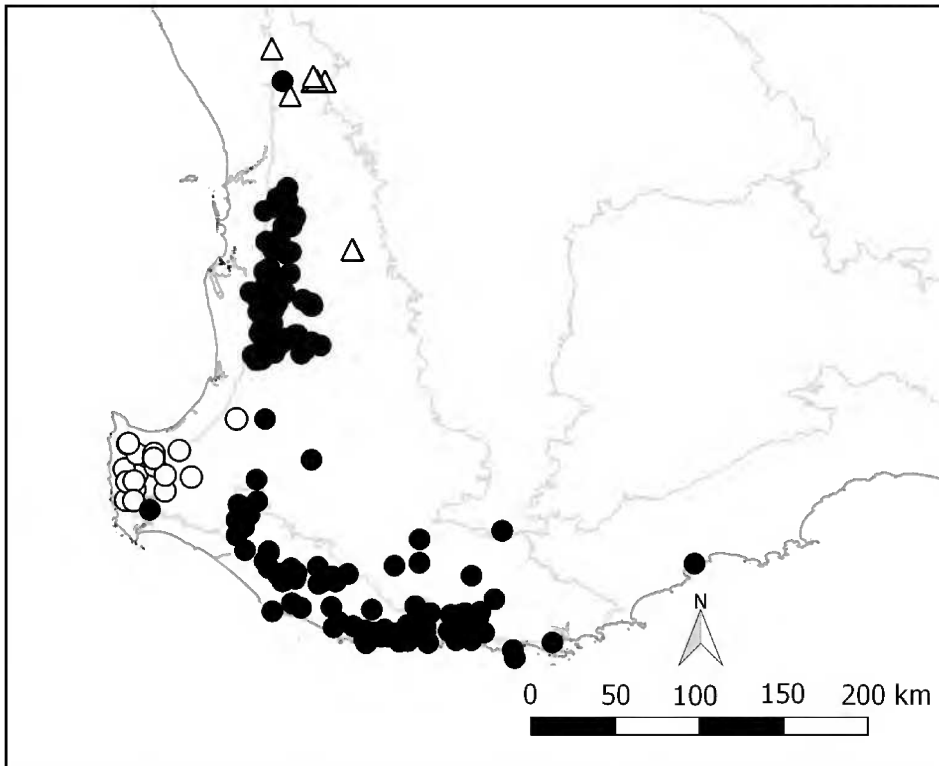


Figure 3. Distribution of *Lasiopetalum caroliae* (Δ), *L. floribundum* (\bullet) and *L. occidentale* (\circ) in Western Australia, with IBRA regions (Department of the Environment 2013) in pale grey.

Affinities. *Lasiopetalum caroliae* has leaves most similar in texture to *L. glabratum* Paust but they are not as coriaceous and the apex is rounded rather than acute. The scale-like, stellate hairs (Figure 1A) readily distinguish it from all other species within this group.

Lasiopetalum floribundum Benth., *Fl. Austral.* 1: 265 (1863). *Type citation*: ‘W. Australia, Drummond, n. 28 and 156, Oldfield, Maxwell: Darling Range, Collie; between Perth and King George’s Sound, Harvey.’ *Type specimens*: Swan R[iver, Western Australia, 1842], *J. Drummond* 2: 28 (*lecto*, here designated: K 000686582! [two right hand fragments]; *isolecto*: BM 000031048! [right hand fragment ‘b’]; BM 000031049!; CGE 12991!; G 00358447 image!; G 00358448 image!; K 000749704! [left hand fragment ‘a’]; LD 1679775!; MEL 235665 image!; W 9005! [two left hand fragments]); Swan River, Western Australia, *J. Drummond* 156 (*syn*: K 000686591!; MEL 235654 image!); W. Aust., *Oldfield s.n.* (*syn*: K 000686589!; MEL 235663 image!); West. Australia, *Maxwell s.n.* (*syn*: MEL 52341!); Swan R[iver] Darling Range, *Collie s.n.* (*syn*: K 000686586! [right hand fragment]); ‘between Perth and K. G. Sound, W. Australia. April, July 1854’, *W.H. Harvey s.n.* (*syn*: K 000686584 image!, K 000686587!) = *L. glabratum* Paust.

Corethrostylis parviflora Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 20(1): 174 (1847), *non Lasiopetalum parviflorum* Rudge (1811). *Type citation*: ‘In Nova Hollandia occidentali prope Gorge of Murray legit cl: Gilbert. coll. ejus n. 83.’ *Type specimen*: 200 m W of Pinjarra–Williams Road on East Boundary Road, south east of Dwellingup, Western Australia, 6 December 1993, *C.F. Wilkins & K.A. Shepherd* CW 546 (*neotype*, here designated: PERTH 07971303).

Corethrostylis oppositifolia F.Muell., *Fragm.* 2(11): 6 (1860). *Type*: 'In Nova Hollandia austro-occidentali. Maxw.' (possible *holo*: MEL 52341!), *non Lasiopetalum oppositifolium* F.Muell. (1860).

Erect *shrub*, 0.6–2(–3) m high, 0.8–1.8(–3) m wide. *Young stems* moderately densely to densely hairy, with pale brown, golden, ferruginous or rarely purple-red (towards apex), stellate hairs, mainly sessile or with a stalk to *c.* 0.15 mm long, with 3–8 arms, each to 1.1 mm long, over dense, pale tan, stellate hairs each with 8–10 arms, each to 0.2 mm long, glandular hairs absent; mature stems red-brown, glabrescent. *Petioles* (1.5–)2.5–15 mm long, indumentum as for young stems. *Mature leaf blades* soft, ovate to broadly ovate, scarcely discoloured, (4–)25–58 mm long, (3.1–)13–43 mm wide, base cordate, apex acute or rounded-acute; margin entire, irregular, sinuate, multilobed, scarcely recurved or flat; abaxial surface with dense, sessile, golden, pale or dark tan-centred, stellate hairs (darker on veins) with 6–10 arms, each to 0.6 mm long, glandular hairs absent; adaxial surface with occasional, to moderately dense, tan to pale tan (occasionally red on new growth), stellate hairs with 6–10 arms, each 0.4–0.6 mm long, glandular hairs absent. *Inflorescence* a loose dichasium or compound dichasium, 43–73(–130) mm long, with 10–23(–40) flowers; *peduncles* 19.6–38.1 mm long, with occasional to scattered, sessile, pale gold, or ferruginous, stellate hairs with *c.* 12 arms, each 0.3–7 mm long, over dense, sessile, white, stellate hairs with 8–10 rotate arms, each to 0.2 mm long, and scattered to moderately dense, red-tipped, glandular hairs to 1.3 mm long. *Pedicels* 2.6–5.8 mm long, indumentum as for peduncles. *Bract* linear or very narrowly ovate, 0.9–1.6(–2.7) mm long, 0.1–0.2(–0.4) mm wide. *Epicalyx* bract attachment (0.3–)1–3 mm below the calyx, dark red, very narrowly ovate to linear, 0.5–1.2 mm long, 0.1–0.15 mm wide; abaxial surface apex and margin with scattered, white, or ferruginous, stellate hairs with 6–8 arms, each to 0.2 mm long, and occasional glandular hairs to 0.2 mm long; adaxial surface glabrous, or with moderately dense, white or pale tan, stellate hairs with *c.* 6 arms, each to 0.15 mm long, glandular hairs absent. *Calyx* mainly pale pink, mauve or white, base dark red, 5.5–6.1 mm long with the tube 0.4–0.6 mm long; lobes narrowly ovate, 5.1–5.5 mm long, 0.7–1.1 mm wide; apex acute; outer surface with occasional to moderately dense, pale tan, stellate hairs with *c.* 8 arms, each to 0.8 mm long, over moderately dense to dense, white or pale tan, stellate hairs with 5–12 rotate arms, each to 0.15 mm long, glandular hairs absent; inner surface with scattered, white, simple or stellate hairs with 2–6 arms, each to 0.15 mm long. *Staminal filaments* 0.25–0.6 mm long, 0.15–0.2 mm wide. *Anthers* ovate, red-purple, 1.1–1.3(–1.6) mm long, 0.5–0.6 mm wide. *Ovary* 0.5–1 mm long, 0.5–1 mm wide, outer surface green with dense, white, stellate hairs to 0.15 mm long, rarely with occasional, red, glandular hairs to 0.2 mm long. *Style* 2.5–2.8 mm long. *Fruit* obovate, *c.* 3 mm long, *c.* 2.6 mm wide, with residual moderately dense, white, stellate hairs and scattered, glandular hairs. *Seed* ellipsoid, dull, black, 1.5–1.9 mm long, 0.9–1 mm wide, with scattered, white, stellate hairs; aril a yellow cap with two short arms, 0.7 mm long, *c.* 1.1 mm wide. (Figures 4, 5)

Diagnostic features. *Lasiopetalum floribundum* may be distinguished from other species in the genus that have reflexed, fan shaped, stellate hairs along the length of the style, by its compound dichasium inflorescences with ≥ 10 flowers, the narrow epicalyx bract, narrow calyx lobes < 1.1 mm wide, the soft, scarcely discoloured, ovate leaves with brown, golden or ferruginous (rarely purple-red), stellate hairs and the presence of glands on the pedicels and peduncles but not on the outer surface of calyx.

Selected specimens examined. WESTERN AUSTRALIA: Samson Brook transect, Samson Block, 20 Apr. 2000, *R.R. Archer* RRA 105 (PERTH); Gleneagle Forest, Kinsella Rd, between Albany and Brookton Hwys, near Canning Rd, 21 Oct. 1981, *M.G. Corrick* 7852 (CANB, MEL); NW of Stirling dam in watercourse, 29 May 1996, *R. Davis* RD 955 (PERTH); towards Jarrahdale, 16 Sep. 1997, *S. Donaldson & G. Flowers* SD 1674 (PERTH); Ernest Forest Block W of Harvey, 10 May 1980, *D. Halford* 8055 (PERTH); Denmark shire, N of South Coast Hwy, FR 17925, 13 Nov. 1999, *B.G. Hammersley* 2363 (PERTH); Karri Valley between Bridgetown to Nannup, 19 Nov. 1987,



Figure 4. *Lasiopetalum floribundum* typical form. A – habit; B – flowering branchlets; C – soft, broadly ovate leaves with rounded-acute apices and compound dichasial inflorescences; D – peduncle and pedicels covered in stellate hairs and red-tipped, glandular hairs and flowers with pale pink, narrow, petaloid calyx lobes with red patch at base. Voucher: *K.A. Shepherd & S.R. Willis* KS 1655. Photographs by *K.A. Shepherd*.

G.J. Keighery 11,250 (AD, BRI, CANB, K, MEL, NSW, PERTH); Torbay Hill, West Cape Howe NP, W of Albany, 24 Nov. 1991, *G.J. Keighery* 12,513 (PERTH); Mt Barker to Denmark Rd, NNE of Denmark, 1 Nov. 1995, *T.R. Lally* 845 (BRI, CANB, HO, PERTH); 2 km W on Nelson Rd from the South Western Hwy, D'Entrecasteaux NP, 25 Oct. 2016, *K.A. Shepherd & C.F. Wilkins* KS 1641 (PERTH); 1.1 km W on the Harvey–Quindanning Rd from Honeymoon Rd, E of Harvey, 12 Nov. 2016, *K.A. Shepherd & S.R. Willis* KS 1655 (AD, CANB, MEL, NSW, PERTH); Chalk Forest Block, N of Collie, 9 Oct. 2002, *B.G. Ward & R.J. Cranfield* FC 370 (PERTH); Walpole–Nornalup NP, 27 Jan. 1993, *J.R. Wheeler* 3791 & *S.J. Patrick* (PERTH); power line track, E Boundary Rd W of Pinjarra–Williams Rd, 6 Dec. 1993, *C.F. Wilkins & K.A. Shepherd* CW 546 (PERTH); Harvey–Quindanning Rd, corner of Doodanally Rd, 6 Dec. 1993, *C.F. Wilkins & K.A. Shepherd* CW 552 (CANB, PERTH); near Serpentine Dam, SE of Jarrahdale, 30 Nov. 2004, *C.F. Wilkins & B. Vincent* CW 2097 (PERTH).

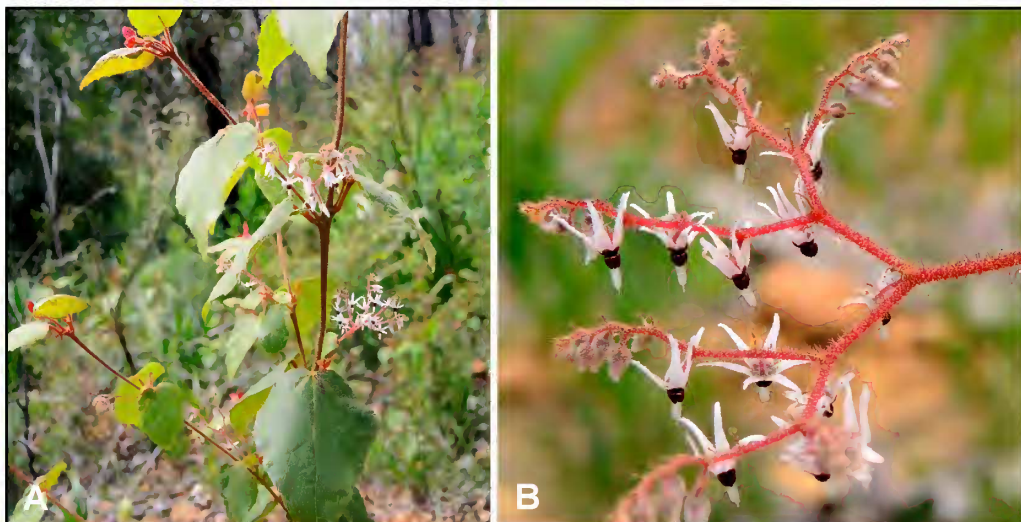


Figure 5. *Lasiopetalum floribundum* southern form. A – habit, showing large, ovate leaves with acute apices; B – compound dichasial inflorescence with large numbers of small, white flowers. Voucher: K.A. Shepherd & C.F. Wilkins KS 1641. Photographs by K.A. Shepherd.

Phenology. Flowering has been recorded from September to December. Fruiting material has been observed on specimens collected in December.

Distribution and habitat. *Lasiopetalum floribundum* is distributed from the Canning Dam near Perth to West Cape Howe, west of Albany, in the Swan Coastal Plain, Jarrah Forest, Warren and Esperance Plains bioregions (IBRA7; Department of the Environment 2013) (Figure 3). It is found in jarrah, marri, karri and tingle forest, in lateritic sandy clay or grey, loamy sand, often with granite boulders, mainly in river valleys near creek lines.

Conservation status. This species is reasonably widespread and not considered to be under threat at this time.

Typification. Bentham's (1863) description of *L. floribundum* is quite broad, encompassing the morphological variation evident across the six collections he cited in the protologue. Five of these (*Drummond 28*, *Drummond 156*, *Oldfield s.n.*, *Maxwell s.n.* and *Collie s.n.*) match our current understanding of *L. floribundum* (although the *Oldfield* collection represents a southern variant of the species; see *Notes* section below); however, Harvey's collection is referable to *L. glabratum*. It is therefore necessary to designate a lectotype to fix the application of the name *L. floribundum*.

In addition to specimens in his own herbarium (now at K), Bentham had access to a wide variety of material when compiling *Flora Australiensis*, including but not limited to specimens in Hooker's Herbarium (K), Lindley's herbarium (CGE), Mueller's herbarium (MEL), the Banksian herbarium and Robert Brown's herbarium (BM). Of the type material cited above, Bentham is thought to have seen the following sheets: K 000686582 (*Drummond 2: 28*, Herbarium Benthamianum), CGE 12991 (*Drummond 2: 28*), K 000686591 (*Drummond 156*, Herbarium Hookerianum), K 000686589 (*Oldfield s.n.*, Herbarium Hookerianum), MEL 23566 (*Oldfield s.n.*, annotated 'B' indicating Bentham viewed the material), MEL 52341 (*Maxwell s.n.*, annotated 'B'), K 000686584 and K 000686587 (*Harvey s.n.*, Herbarium Hookerianum), and K 000686586 (*Collie s.n.*, Herbarium Hookerianum).

While Bentham may have also viewed BM 000031048 and BM 000031049, there are no annotations on either sheet to confirm this.

Drummond's '28' gathering from his second series matches the protologue and constitutes the largest amount of type material located to date, with many of the duplicates being of reasonable quality. The two right hand fragments on K 000686582 are designated here as the lectotype. This material bears the label '28 *Corethrostylis* Swan River Drummond' written in Bentham's hand and is stamped with 'Herbarium Benthamianum 1854' and as such comprised part of his personal collection. Two other fragments on the left hand side of the sheet (K 000686583) do not represent type material: these fragments are from a different Drummond gathering (n. 20) and are referable to *L. glabratum*.

The two 'W. Aust.' *Oldfield s.n.* sheets (K 000686589; MEL 235663) are a match for the southern variant of *L. floribundum* (see *Notes* below).

Corethrostylis parviflora was considered a synonym of *L. floribundum* by Bentham (1863) based on Turczaninow's (1847) protologue ('from the character given'). This name was based on material collected by Gilbert (n. 83) 'In Nova Hollandia occidentali prope Gorge of Murray'; however, the relevant sheet at the National Herbarium of Ukraine (KW 001000138) does not include corresponding plant material. While a Gilbert label annotated with the number 83 and the name *Corethrostylis parviflora* is mounted on the lower right-hand side of this sheet there is no reference to the collecting locality of Murray River. Moreover, the four plant fragments on the sheet all correspond to type material of *C. microphylla* Turcz. (KW 001000139, left-hand label, *Drummond* 259), a species Bentham (1863) later synonymised under *L. cordifolium* Endl., and as such are in serious conflict with the protologue of *C. parviflora*.

Specimens in the Turczaninow herbarium (KW-TURCZ) were originally unmounted and often two or more specimens/fragments and their corresponding labels were placed in one folder or on one sheet. The type specimens of taxa described by Turczaninow were mounted in the 1970s exactly as they were arranged on sheets. No specimen corresponding to *C. parviflora* has been found after a thorough search at KW, and therefore it is likely to be lost (S. Mosyakin pers. comm.). As a consequence we consider that the Gilbert material used by Turczaninow is no longer extant (or, if extant it is lost or misplaced and cannot be associated with the original label with any degree of certainty). Moreover, no duplicates have been located to date. Turczaninow's description of *C. parviflora* is referable to *L. floribundum* (or possibly *L. occidentale* K.A. Sheph. & C.F. Wilkins but this species is known to occur south-west of the Murray River) and while *C. parviflora* is an earlier name, this epithet is already occupied in *Lasiopetalum* by *L. parviflorum* Rudge (1811), a species confined to the east coast of Australia. In the absence of original material, *sensu* Art. 9.3 of the *International Code of Nomenclature for algae, fungi, and plants* (ICN), we were unable to apply the name *C. parviflora* with certainty; consequently we have designated a neotype (ICN Art. 9.7) to fix the application of this name and ensure that it corresponds to the protologue.

Corethrostylis oppositifolia (Mueller 1860) is an earlier name for *L. floribundum* but the epithet is already occupied by *L. oppositifolium* F. Muell. (a distinct species from north of Geraldton), having been named by Mueller at the same time. MEL 52341, which is annotated by Mueller as 'West Australia Maxwell', is interpreted as a possible holotype for this name. Although Mueller did not annotate it with the species name, it is the only known matching specimen. This collection is also a syntype of *L. floribundum* Benth.

Affinities. *Lasiopetalum floribundum* remains quite variable across its range (see *Notes* section below), despite the exclusion of the Margaret River species recognised herein as *L. occidentale*. It can be distinguished from that species in having entire to irregular or occasionally multilobed leaves (*cf.* consistently distinctly trilobed), a longer inflorescence 42–73(–130) mm long (*cf.* 19–28(–41)) and 10–23(–40) flowers per inflorescence (*cf.* 5–7(–9)). Plants with lobed leaves are also readily distinguished from *L. pterocarpum* E.M.Benn. & K.A.Sheph. in having an ovoid rather than winged ovary and sparser hairs on the abaxial leaf surface. Further comparative notes are provided in the affinities section for *L. pterocarpum*.

Lasiopetalum floribundum has soft, pliable leaves similar to those of *L. rutilans* K.A.Sheph. & C.F.Wilkins and *L. mouleian* K.A.Sheph. & C.F.Wilkins but it is distinguished from these species in having narrower calyx lobes ≤ 1.1 mm wide (*cf.* 1.4–2.8), the base of the inner calyx being dark red (*cf.* dark red and green) and 10–23(–40) flowers per inflorescence (*cf.* 2–15).

Notes. Considerable morphological variation in the size, shape and possibly the indumentum of leaves as well as the number of flowers remains within *L. floribundum*. This variation is particularly evident when comparing the northern-most specimens from the Perth region (*c.* 32° S latitude) found in jarrah and marri forest to collections in the karri forest near Walpole and Denmark (34° to 35° S latitude). The northern form usually has mature leaves that are broadly ovate (Length:Width = 1:1) with more rounded-acute apex, and dichasial inflorescences to 75 mm long with 6–23 bright pink flowers (Figure 4). In contrast, plants from the southern Karri forest regions have ovate mature leaves (L:W = 3:2) with an acute apex and usually compound dichasial inflorescences to 90 mm long with 10–23(–40) white or pale pink flowers (Figure 5). While the two extremes appear distinct it is difficult to consistently distinguish the two forms across the range of the species. Most of the type material cited by Bentham (1863) in the protologue matches the northern form (as does the designated lectotype), although the two *Oldfield s.n.* syntypes (K 000686589; MEL 235663) are consistent with the southern form of the species. A detailed morphological and molecular analysis of *L. floribundum* across its entire range is required to assess the taxonomic status of the southern form and confirm if it should be recognised as a distinct taxon.

Lasiopetalum glabratum Paust, *Nuytsia* 1: 359, Figures 8, 12 (1974). *Type:* Two miles north of turnoff to Mount Cooke on Albany Highway, Western Australia, 6 November 1971, *S. Paust* 1068 (*holo:* PERTH 01625527!).

Erect or spreading *subshrub* to *shrub* 0.25–0.4(–0.8) m high, 0.1–1 m wide. *Young stems* densely hairy to tomentose, with scattered, tan, stellate hairs, mainly sessile or with a stalk to *c.* 0.15 mm long, with 10–15 arms, each to 0.5 mm long, over dense, tan or dark red, stellate hairs, with 10–15 arms, each to 0.2 mm long, and scattered, red-tipped, glandular hairs to 0.5 mm long; mature stems red-brown, glabrescent. *Petioles* 1.5–6 mm long, indumentum as for young stems but without glands. *Mature leaf blades* coriaceous, ovate to broadly ovate, scarcely discoloured, (3–)14–40 mm long, (2.8–)13.3–22 mm wide, base cordate, apex acute or rounded-acute, margin irregular, entire or occasionally trilobed, flat or scarcely recurved; abaxial surface glabrous or with occasional or scattered, sessile, beige or white (some pale tan-centred), stellate hairs with 6–12 arms, each to 0.3 mm long on veins, glandular hairs mainly absent or scattered on veins or margin, to 0.5 mm long; adaxial surface glabrous or with occasional, beige or white with some pale tan-centred, stellate hairs with 10–12 arms, each to 0.6 mm long on veins. *Inflorescence* a loose monochasium or dichasium, 36–72(–129) mm long, with 3–6(–9) flowers; *peduncles* 19.1–42 mm long, with moderately dense to dense, sessile, pale tan, stellate hairs with 10–12 arms, each to 0.3 mm long, beneath dense, red-tipped, glandular hairs 0.2–0.5 mm

long. *Pedicels* 2.3–4.8 mm long, indumentum as for peduncles. *Bract* linear, very narrowly ovate to narrowly ovate, 0.8–4.3 mm long, 0.2–0.4(–0.8) mm wide. *Epicalyx bract* attachment 0.1–0.7 mm below the calyx, green, narrowly ovate to linear, 1–2.5 mm long, 0.15–0.3 mm wide; abaxial surface and margin with scattered to moderately dense, pale tan, stellate hairs, with 8–10 arms, each to 0.3 mm long, and glandular hairs to 0.25 mm long; adaxial surface glabrous, or with scattered, white, stellate hairs with *c.* 6 arms, each to 0.15 mm long, glandular hairs absent. *Calyx* pale mauve-pink, base dark red, 6.2–7.1 mm long with the tube 0.4–0.8 mm long; lobes narrowly elliptic, 5.6–6.3 mm long, 1.3–3 mm wide, apex acute; outer surface with moderately dense, white or pale tan, stellate hairs with 6–10 arms, each to 0.15 mm long (occasionally to 0.4 mm long), and scattered, red-tipped, glandular hairs to 0.4 mm long; inner surface with scattered, white, simple or stellate hairs with 2–6 arms, each to 0.15 mm long. *Staminal filaments* 0.5–0.8 mm long, 0.15–0.2 mm wide. *Anthers* ovate, red-purple, 1.5–2 mm long, 0.7–0.8 mm wide. *Ovary* 0.5–1 mm long, 0.5–1 mm wide; outer surface green with dense, white, stellate hairs to 0.15 mm long, rarely with occasional, red, glandular hairs to 0.2 mm long. *Style* 2.4–3.7 mm long. *Fruit and seed* not observed. (Figure 6)

Diagnostic features. *Lasiopetalum glabratum* is distinctive within the group of species allied to *L. floribundum* in having ovate, coriaceous leaves with an acute apex, that are mainly glabrous or with only a few stellate hairs present on the veins.

Other specimens examined. WESTERN AUSTRALIA: Russell Forest Block, 14 Mar. 2000, *C. Adonis* CA 16 (PERTH); NW of Mt Yetar, 5 Nov. 1996, *M.G. Allen* 163 (PERTH); W of Poison Gully off Brookton Hwy, 6 Oct. 2003, *R.J. Cranfield* FC 525 (PERTH); SSE of Mt Dale, 16 July 1997, *R. Davis* 3848 (PERTH); NW of North Bannister, 24 Oct. 1991, *W. Greuter* 23210 (PERTH); SSW of Mt Vincent, 5 Aug. 1997, *A. Gundry* 27 (PERTH); W of North Bannister, 23 Nov. 2003, *M. Hislop* 3112 (PERTH); WSW of Mt Solus, 31 July 1997, *M.J. Kealley* 645 (PERTH); ESE of Mt Cooke, 9 Aug. 1997, *M.J. Kealley* 1174 (PERTH); near Mt Cooke, 12 May 1993, *K.L. Lemson* KLL 307 (PERTH); Albany Hwy, S of Armadale, 8 May 1983, *T.D. Macfarlane* 1147 (PERTH); Sawyers Valley, 1 Dec. 1987, *M. Mandra s.n.* (PERTH); W of Metro Rd, S of Brookton Hwy, 9 Jan. 1999, *L.W. Sage, F. Hort & J. Hort* LWS 1469 (PERTH); W of Sullivan's Rock, 26 Oct. 1996, *K.A. Shepherd & J.A. Wege* KS 258 (PERTH); Sullivan's Rock above the picnic area, 9.6 km SSW on the Albany Hwy from Jarrahdale Rd, 27 Oct. 2016, *K.A. Shepherd & C.F. Wilkins* KS 1653 (PERTH); Geddes Block, 8 Feb. 1999, *R. Smith* RSS 700 (PERTH); S of Sullivan's Rock, 17 Nov. 1993, *C.F. Wilkins* 355 (PERTH); Saint Ronan's NR, 13 Oct. 2003, *C.F. Wilkins & J.A. Wege* CW 1788 (PERTH).

Phenology. Flowering usually from August to December, although flowers were observed on a specimen collected in early January from a winter-wet area (*L.W. Sage et al.* LWS 1469).

Distribution and habitat. *Lasiopetalum glabratum* is found east of Perth in the Swan Coastal Plain, Jarrah Forest and Avon Wheatbelt bioregions (IBRA7; Department of the Environment 2013) (Figure 7). This species grows in jarrah forest with *Allocasuarina fraseriana* and *Xanthorrhoea preissii* or open wandoo woodland in brown, lateritic loam over granite.

Conservation status. While this species does not have a wide distribution it is generally locally abundant and is not considered to be under threat at this time.

Affinities. Refer to comparative notes under the affinities section for *L. caroliae*.



Figure 6. *Lasiopetalum glabratum*. A – flowering branch, showing coriaceous leaves that are glabrous or have scattered stellate hairs on the veins; B – inflorescence, showing moderately dense, stellate hairs on the pedicels, and very short epicalyx bract (white arrow) subtending the petaloid calyx; C – flowers, each with narrowly ovate, pale pink, petaloid calyx lobes with red patch at base. Voucher: *K.A. Shepherd & C.F. Wilkins* KS 1653. Photographs by K.A. Shepherd.

Lasiopetalum moulleian K.A. Sheph. & C.F. Wilkins, *sp. nov.*

Type: north-east of Kwolyin, Western Australia [precise locality withheld for conservation reasons], 28 September 2016, *K.A. Shepherd & C.F. Wilkins* KS 1621 (*holo:* PERTH 08858160; *iso:* AD, BRI, CANB, K, MEL, NSW, PERTH 08844216).

Lasiopetalum sp. Mount Caroline (S.D. Hopper SDH 6381), Western Australian Herbarium, in *FloraBase*, <https://florabase.dpaw.wa.gov.au/> [accessed 30 August 2016].

Erect or spreading *shrub* 0.4–1.8 m high, *c.* 1.5 m wide. *Young stems* moderately densely to densely hairy, with red, stellate hairs, mainly sessile or with a stalk to 0.15 mm long, and 7–10 arms, each to 1.8 mm long, over moderately dense white, stellate hairs with 6–8 arms, each to 0.2 mm long, glandular hairs absent; mature stems red-brown, glabrescent. *Petioles* (0.6–)2.3–9.1 mm long, indumentum

as for young stems. *Mature leaf blades* soft, ovate, scarcely discoloured, (2–) 5.6–22.7 mm long, (1.6–)6–16 mm wide, base cordate, apex acute; margin entire to sinuate, flat or scarcely recurved; abaxial surface with scattered yellowish cream or tan, stellate hairs with 6–10 arms, each to 0.8 mm long, over moderately dense white, stellate hairs with 8–10 arms, each to 0.15–3 mm long; adaxial surface with scattered to moderately dense, cream-brown, stellate hairs with 8–10 arms, each to 0.8 mm long, glandular hairs absent. *Inflorescence* a loose monochasium or rarely a dichasium 17–48 mm long, with 2–6 flowers per inflorescence; *peduncles* 14.3–34.1 mm long, with moderately dense to dense stellate hairs with c. 12 rotate arms, each to 0.15 mm long and scattered to moderately dense, red-tipped, glandular hairs to 1.5 mm long and with or without scattered bright red, stellate hairs with 4–8 arms, each to 1.1 mm long. *Pedicels* 4.3–7.3 mm long, indumentum as for peduncles. *Bract* very narrowly ovate or very narrowly elliptic, 1.5–3.5 mm long, 0.15–0.5 mm wide. *Epicalyx bract* green, attachment 0.1–0.9 mm below the calyx, very narrowly elliptic, 1–2.7 mm long, 0.15–0.5 mm wide; abaxial surface with scattered tan, stellate hairs with c. 6 arms, each to 0.5 mm long; adaxial surface with a white, apical stellate hair with c. 6–10 arms, each to 0.8 mm long and with or without occasional to scattered stellate hairs with c. 6 rotate arms, each to 0.2 mm long, glandular hairs absent. *Calyx* pale mauve-pink, base dark red with green at the lobe junctions, 5.5–6.2 mm long, with a tube 0.5–0.9 mm long; lobes narrowly ovate, 4.8–5.7 mm long, 1.4–1.7 mm wide, apex acute; outer surface with tan stellate hairs with c. 6 arms, each to 0.7 mm long, over moderately dense white, stellate hairs throughout, each with c. 6 arms, to 0.15 mm long and scattered glandular hairs to 1.3 mm long; inner surface with scattered white, stellate hairs with 1–6 arms, each 0.15 mm long. *Staminal filaments* 0.5–0.7 mm long, 0.15–0.2 mm wide. *Anthers* ovate, red-purple, 1.5–1.7 mm long, 0.6–0.8 mm wide. *Ovary* 0.8–1 mm long, 0.8–1 mm wide; outer surface with dense, white, stellate hairs to 0.3 mm long, rarely with glandular hairs to 0.2 mm long. *Style* 2.5–2.8 mm long. *Fruit* an ellipsoid to scarcely obovoid capsule, 3–4 mm long, 3–4 mm wide, with residual, moderately dense, small, white, stellate hairs. *Seed* ellipsoid, dull, blackish brown with few to moderately dense, stellate hairs, 2–2.3 mm long, 1–1.3 mm wide, aril a cream-brown cap with 2–5 arms, as long as, or longer than seed, 1.6–2.3 mm long, 1–1.3 mm wide. (Figure 8)

Diagnostic features. *Lasiopetalum moulleian* is distinguished from allied species by the presence of a moderately dense layer of small, white, stellate hairs beneath the large yellowish cream or tan, stellate hairs on the lower surface of the leaves; an inflorescence with 2–6 flowers; the outer surface of the calyx covered in small, white, stellate hairs throughout (beneath the glandular and larger stellate hairs); stellate hairs on the inner surface of the calyx; and a large seed aril with 2–5 arms, which is as long as, or longer than seed.

Specimens examined. WESTERNAUSTRALIA: [localities withheld for conservation reasons] 30 Sep. 1988, J.J. Alford 1106 (PERTH); 1 Sep. 2016, N. Moore, J. Borger & J. Lindley JBKok-10 (NSW, PERTH); 4 July 1988, S.D. Hopper SDH 6381 (PERTH); 12 Nov. 1996, L. Sweedman 4352 (PERTH); 2 June 1975, E. Wittwer 1540 (PERTH).

Phenology. Flowering recorded from June to November with seeds collected in December (A. Crawford pers. comm.).

Distribution and habitat. *Lasiopetalum moulleian* is an extremely restricted species currently known from only two localities in the Kellerberrin–Kwolyin area of the Avon Wheatbelt bioregion (IBRA7; Department of the Environment 2013) (Figure 7). This species is found growing in loam over massive granite, or at the base of granite rock, under *Eucalyptus caesia* with sedges and grasses or associated with *Tetradlea deltoidea* thickets.

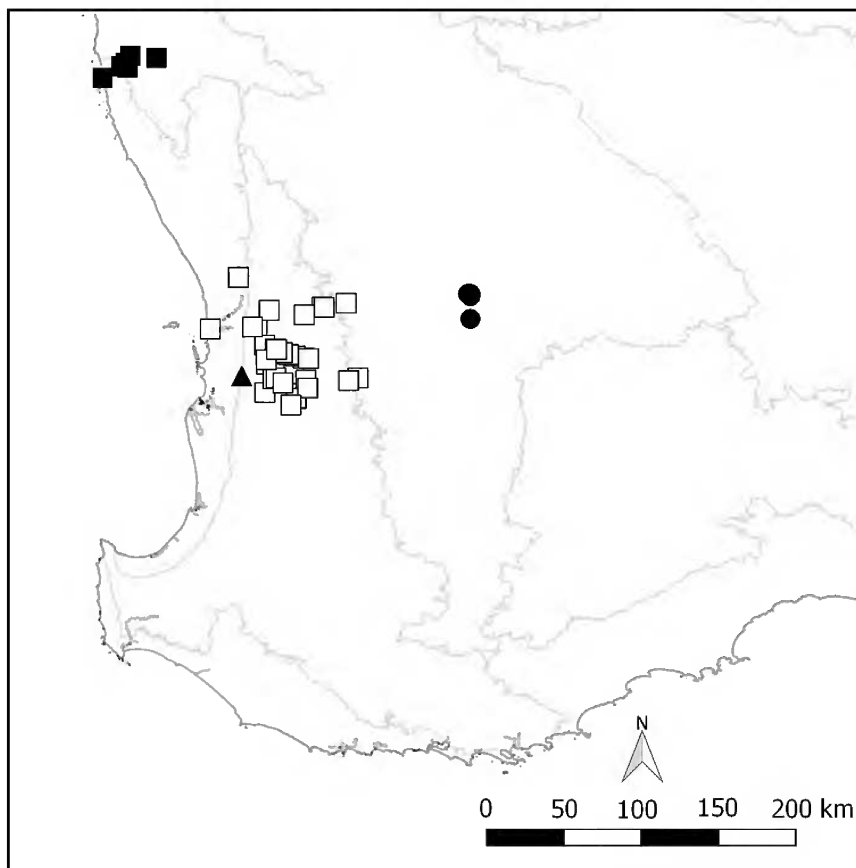


Figure 7. Distribution of *Lasiopetalum glabratum* (□), *L. pterocarpum* (▲), *L. rutilans* (■) and *L. moullean* (●) in Western Australia, with IBRA regions (Department of the Environment 2013) in pale grey.

Conservation status. *Lasiopetalum moullean* is currently listed by Smith (2017) as Priority Two under Department of Parks and Wildlife Conservation Codes for Western Australian Flora, under the name *L. sp. Mount Caroline* (S.D. Hopper SDH 6381). This species was previously only known from Mt Caroline and was represented by only four specimens at the Western Australian Herbarium collected between 1975 and 1996. Targeted survey efforts in recent years had failed to relocate any plants at Mt Caroline, an area that is currently heavily grazed by kangaroos and native wallabies (Natasha Moore pers. comm.); however, in the spring of 2016 Natasha Moore and Jazmin Lindley (Department of Biodiversity, Conservation and Attractions, formerly Parks and Wildlife) along with Jenny Borger discovered a single plant south-east of Mt Caroline (Figure 8A). This team later discovered another small plant at Mt Caroline. As these remain the only two known extant plants of this species it is probable that this species will in the near future be recognised as Threatened.

Etymology. The granite hills and surrounds near Mt Caroline were collectively referred to as the ‘Moullean’ (alternate spelling ‘Mullean’) by the local Noongar people (Drummond 1847; Wilson 1981; Harben *et al.* 2008). The specific epithet recognises the restricted distribution of this species in this region, and is used here as a noun in apposition.



Figure 8. *Lasiopetalum moulelean*. A – habit, with Natasha Moore (left) and Jazmin Lindley (right) who, with Jenny Berger, rediscovered the only two extant plants currently known of this species; B – leaves, showing the bright red colour of the stellate hairs on new growth; C – branchlet showing ovate leaves and monochasial inflorescences; D – flowers, highlighting the pale pink calyces with a red base with green at the junction of each lobe; E – outer surface of calyx and red pedicel with scattered, bright red, stellate hairs and glands over dense, small, white, stellate hairs. Voucher: K.A. Shepherd & C.F. Wilkins KS 1618. Photographs by K.A. Shepherd (A–C, E) and A. Crawford (D).

Affinities. *Lasiopetalum moulelean* is similar to *L. rutilans* in having bright red, stellate hairs evident on new growth of the stem, outer surface of calyx, pedicels and peduncle. It is readily distinguished from this species by the indumentum on the abaxial surface of the leaf, which has a moderately dense layer of small, white, stellate hairs beneath the large, yellowish cream or tan, stellate hairs (*cf.* small hairs absent beneath the larger stellate hairs), calyx lobes 1.4–1.7 mm wide (*cf.* (1.7–)2–2.8 mm wide) with small, white, stellate hairs all over the outer surface (*cf.* small stellate hairs at the base of the calyx or lobe margins only), stellate hairs on the inner surface of the calyx (*cf.* glabrous), and a distinct seed aril 1.6–2.3 mm long, with 2–5 arms. The arils in all other species of this group have only two arms and the total length of the aril ranges from 0.7–1.5 mm.

Also refer to the comparative notes under the affinities section for *L. floribundum*.

Lasiopetalum occidentale K.A. Sheph. & C.F. Wilkins, *sp. nov.*

Type: 800 m south of Gale Road on Caribunup Road South, south of Dunsborough, Western Australia, 12 November 2016, *K.A. Shepherd & S.R. Willis* KS 1654 (*holo:* PERTH 08858225; *iso:* AD, BM, BRI, CANB, DNA, HO, K, MEL, NSW, PERTH 08844208).

Erect, open *shrub* 0.3–3 m high, *c.* 1.8 m wide. *Young stems* densely hairy, with scattered, pale tan or tan, stellate hairs, mainly sessile or with a stalk to *c.* 0.15 mm long, with 3–10 arms, each to 1.3 mm long, over moderately dense, pale tan or beige, stellate hairs with 8–10 arms, each to 0.3 mm long, and with or without scattered, globular glands to 0.1 mm long; mature stems red-brown, glabrescent. *Petioles* (1.1–)2.2–8.3 mm long, indumentum as for young stems. *Mature leaf blades* soft, trilobed-ovate, scarcely discoloured (2.5–)6–27.3 mm long, (1.9–)3.8–27.3 mm wide, base scarcely cordate or rounded, apex acute; margins distinctly trilobed, flat or scarcely recurved; abaxial surface with moderately dense, tan or pale tan, stellate hairs with 8–12 arms, each to 0.8 mm long, glandular hairs absent; adaxial surface with scattered to moderately dense, cream, stellate hairs with *c.* 10 arms, each to 0.3 mm long and occasionally to 0.8 mm long. *Inflorescence* a loose dichasium, 19–28(–41) mm long, with 5–7(–9) flowers; *peduncles* 5–12.5 mm long, with scattered, pale tan, stellate hairs with 6–12 arms, each to 1.1 mm long, over moderately dense, pale tan, stellate hairs with 6 multiangulate or rotate arms, each to 0.15 mm long, and moderately dense red-tipped glandular hairs to 0.2–1.3 mm long. *Pedicels* 2.7–7.7 mm long, indumentum as for peduncles. *Bract* linear to very narrowly ovate, 0.5–2.3(–3) mm long, 0.15–0.3(–0.4) mm wide. *Epicalyx bract* attachment *c.* 1 mm below the calyx, linear to very narrowly ovate, dark red, 0.5–1.5 mm long, 0.15–0.2 mm wide; abaxial surface, margin and apex with scattered, white, stellate hairs with 10–13 arms, each to 0.6 mm long and with or without scattered, white, stellate hairs with *c.* 10 arms, each to 0.15 mm long below, and with or without occasional glandular hairs to 0.25 mm long; adaxial surface glabrous, or with scattered, white, stellate hairs with *c.* 6 arms, each to 0.2 mm long. *Calyx* mauve-pink, base dark red, 5.1–6.1 mm long, with a tube 0.4–0.6 mm long; lobes narrowly ovate, 4.5–5.7 mm long, 0.9–1.1 mm wide, apex acute; abaxial surface with occasional, cream, stellate hairs with *c.* 8 arms, each to 0.8 mm long, over dense, white, stellate hairs with 6–12 rotate arms each to 0.15 mm long, and with or without occasional glands to 0.15 mm long; adaxial surface with scattered, white, simple or stellate hairs with 1–6 arms, each to 0.15 mm long. *Staminal filaments* 0.5–0.6 mm long, 0.15–0.2 mm wide. *Anthers* ovate, red-purple, 1.1–1.3 mm long, 0.5–0.6 mm wide. *Ovary* 0.7–0.9 mm long, 0.7–0.9 mm wide; outer surface green with dense, white, stellate hairs to 0.15 mm long, and occasional, red, glandular hairs to 0.2 mm long. *Style* 2.2–2.8 mm long. *Fruit* a scarcely obovoid capsule, 3.2–3.5 mm long, 2.4–3.5 mm wide, with dense, small, white, stellate hairs. *Seed* ellipsoid, dull, blackish brown with dense, stellate hairs, seed *c.* 1.8 mm long, *c.* 1.1 mm wide; aril a white cap with two short arms, *c.* 0.7 mm long, *c.* 0.7 mm wide. (Figure 9)

Diagnostic features. *Lasiopetalum occidentale* is readily distinguished from morphologically allied species that have narrow calyx lobes and pliable leaves by the following combination of characters: mature leaves consistently and distinctly trilobed; inflorescences short (19–28(–41) mm), each with only 5–7 flowers.

Selected specimens examined. WESTERN AUSTRALIA: McCorkhill Forest Block, W of Nannup, month unknown 1986, *A.R. Annels* MJP 1832 (PERTH); E of Bussell Hwy, Warren Botanical district, 25 Sep. 1992, *A. Annels* 2426 (PERTH); S of Witchcliffe, 13 Oct. 1992, *A.R. Annels* ARA 2683 (PERTH); Tame Rd, near Molloy Rd, N of Augusta, 8 Jan. 1996, *E. Bennett & C. Godden* SC 155.3 (PERTH); near Nannup, Dec. 1930, *W.E. Blackall s.n.* (PERTH 04158288); S of intersection of Gale and Gibb Rds, SW of Busselton, 11 Dec. 1996, *N. Casson & C. McChesney* SC 66.1 (PERTH); Yelverton State



Figure 9. *Lasiopetalum occidentale*. A – habitat; B – habit; C – branchlet showing trilobed leaves and dichasial inflorescences with few flowers; D – peduncle and pedicels covered in stellate hairs and red-tipped glandular hairs 0.2–1.3 mm long; E – pale pink flowers with a red patch at the base of each calyx lobe. Voucher: *K.A. Shepherd & S.R. Willis* KS 1654. Photographs by *K.A. Shepherd*.

Forest, Cowaramup, 26 Nov. 2005, S.A. Fisher BNC 739 (PERTH); Sabina River crossing, Whicher Range, 17 Oct. 1973, A.S. George 11746 (PERTH); Big Brook, between Cowaramup and Margaret River, 7 Dec. 1974, T.A. Halliday 234 (PERTH); Treeton Forest Block, Margaret River shire, 7 Dec. 2005, G.J. & B.J. Keighery 856 (MEL, PERTH); Forest Grove Block, Margaret River to Augusta, 27 Dec. 1990, G.J. Keighery 12062 (CANB, PERTH); near Donnybrook, Aug. 1913, M. Koch 2123 (PERTH); Vasse–Karridale, Oct. 1898, A. Lea s.n. (PERTH 04158032); Mowen, 10 Oct. 1986, G.S. McCutcheon GSM 1433 (PERTH); near cnr Stuart and Jacka Rds, E of Margaret River, 16 Oct. 2007, M. Morley 417 (AD, MEL, NSW, PERTH); Nillup, SE of Margaret River, 14 Jan. 1945, R.D. Royce R15 (PERTH); Yelverton Forest Block, SW of Busselton, 16 Sep. 1996, D. Papenfus & S. Wood DP 545 (PERTH); Witchcliffe, 28 Oct. 2000, J. Scott 280 (PERTH); Jacka Rd, 1 km S of Stuart Rd, S of Busselton, 24 Oct. 2016, K.A. Shepherd & C.F. Wilkins KS 1634 (AD, BRI, CANB, DNA, HO, K, MEL, NSW, PERTH); Adelaide Block, Wapet Rd, Margaret River, 19 Jan. 1990, G. Wardell-Johnson 1049 (PERTH); Forest Grove NP, Margaret River, 12 Nov. 2002, A. Webb AW 2203 (PERTH).

Phenology. Flowering from August to February. Fruiting material has been observed on specimens collected in December.

Distribution and habitat. *Lasiopetalum occidentale* is distributed from Donnybrook, west to Busselton and Margaret River areas, south to Forest Grove near Witchcliffe and east to Nannup (Figure 3) in the Jarrah Forest and Warren bioregions (IBRA7; Department of the Environment 2013). This species grows in coarse, sandy clay or gravelly loam, sometimes near creek lines or wetlands in alluvial loam, in open marri, jarrah or karri forest or low woodlands often with *Agonis flexuosa*, *Taxandria parviceps*, *Trymalium odoratissimum* and mixed shrubland.

Conservation status. This species is not considered to be under threat at this time.

Etymology. From the Latin *occidentalis* (west or western), as this species comprises the westernmost populations that were previously included under *L. floribundum*.

Affinities. Mature leaves of *L. occidentale* are distinctly trilobed (juvenile leaves may be multilobed); in comparison the typical leaves of *L. floribundum* are always ovate with entire or multilobed margins. *Lasiopetalum occidentale* also has shorter inflorescences 19–28(–41) mm long (cf. 42–73(–130)) and 5–7(–9) flowers per inflorescence (cf. 10–23(–40)) than *L. floribundum*.

Lasiopetalum pterocarpum E.M.Benn. & K.A.Sheph., *Nuytsia* 16(1): 177–179 (2006). *Type*: [Serpentine National Park,] Western Australia [precise locality withheld for conservation reasons], 26 October 1995, K. A. Shepherd & J.A. Wege KS 360 (*holo*: PERTH 07319193).

Lasiopetalum sp. Serpentine (S. Paust 1103 A), Western Australian Herbarium, in *FloraBase*, <https://florabase.dpaw.wa.gov.au> [accessed 15 September 2016].

Erect *shrub*, 0.2–1.5 m high, 0.2–0.5 m wide. *Young stems* densely hairy to tomentose, with scattered to dense, ferruginous, stellate hairs with stalks to 0.8 mm long and 8–10 arms, each to 0.8 mm long, over dense, sessile, white, or white and ferruginous-centred, stellate hairs with 8–10 arms, each to 0.3 mm long, glandular hairs absent; mature stems reddish brown or brown, glabrescent. *Petioles* 4–14 mm long, indumentum as for young stems. *Mature leaf blades* soft, ovate, strongly discolourous, 25–80 mm long, 12–50 mm wide, base cordate, apex acute to obtuse; margin distinctly multilobed, flat or slightly incurved; abaxial surface with a tomentum of scattered, ferruginous, stellate hairs with 4–8 arms, each to 0.4 mm long, over white, stellate hairs with c. 12 arms sometimes rotate, each to

0.15 mm long, more dense on midrib; adaxial surface with scattered to moderately dense, white with tan-centred, stellate hairs with 8–10 arms, each to 0.6 mm long, glabrescent. *Inflorescence* a loose dichasium, 32–62 mm long, with 5–8(–11) flowers, occasionally a simple dichasium with 2 or 3 flowers; *peduncles* 9–55 mm long with scattered, ferruginous or white, stellate hairs with 6 or 7 arms, each to 0.7 mm long, over dense, sessile, white, stellate hairs with 6–10 arms, each to 0.2 mm long, becoming glabrous towards the base; glands absent. *Pedicels* 2.2–4 mm long, indumentum as for peduncles. *Bract* oblong, 0.8–3.8 mm long, 0.2–0.4 mm wide. *Epicalyx* bract attachment 0.5–0.7 mm from base of calyx, filiform, 0.7–3.5 mm long, 0.2–0.5 mm wide, with scattered, ferruginous or white, stalked, stellate hairs with *c.* 8 arms, each to 0.8 mm long, over dense, smaller, white, stellate hairs, with *c.* 10 arms, each to 0.2 mm long. *Calyx* pink, base dark red to purple, 6.2–8.7 mm long, with a tube 0.2–0.7 mm long; lobes narrowly elliptic, 5.7–8 mm long, 1–2.3 mm wide, apex acute; outer surface with scattered, ferruginous or white, stalked, stellate hairs with *c.* 12 arms, each to 0.6 mm long, over dense, stellate hairs with *c.* 12 arms, each to 0.15 mm long, denser towards the calyx base; inner surface with scattered, white, stellate, hairs with 1–6 arms, each to 0.15 mm long. *Staminal filaments* 0.75–1 mm long, 0.15–2 mm wide. *Anthers* elliptic, dark red, 1.4–1.8 mm long, 0.6–0.7 mm wide. *Ovary* 0.7–1 mm long, *c.* 0.9 mm wide; outer surface tomentose with white, stellate hairs and scattered, glandular hairs. *Style* 3–3.7 mm long. *Fruit* an ellipsoid capsule, 5.1–6 mm long, 8.4–10 mm wide (including wings), distinctly 6(–12) winged between the dehiscence lines, each wing *c.* 3.6 mm wide, outer surface with dense, stellate and glandular hairs. *Seed* ellipsoid, dull black, 2.8–3.4 mm long, 1.4–1.5 mm wide, with scattered, stellate hairs; aril a yellow cap with two arms, 1.4–1.5 mm long, 1.5 mm wide. (Figure 10)

Diagnostic features. The distinctly winged fruit of *L. pterocarpum* is unique within the genus (Figure 10E, F).

Specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 7 Sep. 1999, *V. English* 1200 (PERTH); 24 Sep. 1999, *V. English & R.M. Evans s.n.* (PERTH 05414172); 22 Oct. 1899, *R. Helms s.n.* (BRI, NSW); 8 Dec. 1996, *A. Markey* 1021 (PERTH); 5 Aug. 1972, *S. Paust* 1103 A (BRI, PERTH); 30 July 1997, *J.L. Robson s.n.* (PERTH); 26 Sep. 2004, *C.F. & J. Wilkins* 2108 (PERTH); 12 May 2006, *C.F. Wilkins* 2157 (CANB, MEL, NSW, PERTH).

Phenology. Flowering from August to December. Fruiting November and December.

Distribution and habitat. *Lasiopetalum pterocarpum* is a rare species restricted to a single population *c.* 48 km south of Perth in the Jarrah Forest bioregion (IBRA7; Department of the Environment 2013) (Figure 7). This species is found growing in dark brown or red-brown loam or clayey sand over granite, near creek lines and on sloping banks in *Eucalyptus rudis* and *Corymbia calophylla* woodland over dense thickets of *Trymalium odoratissimum*.

Conservation status. This species is listed as Threatened (Critically Endangered) in Western Australia (Smith 2017). In 2009, a survey by Wilkins *et al.* confirmed that *L. pterocarpum* appeared to be confined to a single extant population, which at the time comprised *c.* 600 immature plants.

Affinity. This species is morphologically similar to *L. floribundum* with which it shares broadly ovate leaves, a loose dichasial inflorescence, and pale pink or white flowers with the calyx lobes divided almost to the base. While *L. floribundum* possesses entire to slightly irregularly lobed leaves bearing scattered stellate hairs, *L. pterocarpum* has leaves that are distinctly multilobed and strongly discoloured due to a tomentose stellate-hairy indumentum on the abaxial surface. The peduncle of *L. pterocarpum* is covered in stellate hairs only, while in *L. floribundum* both stellate and glandular hairs are present.

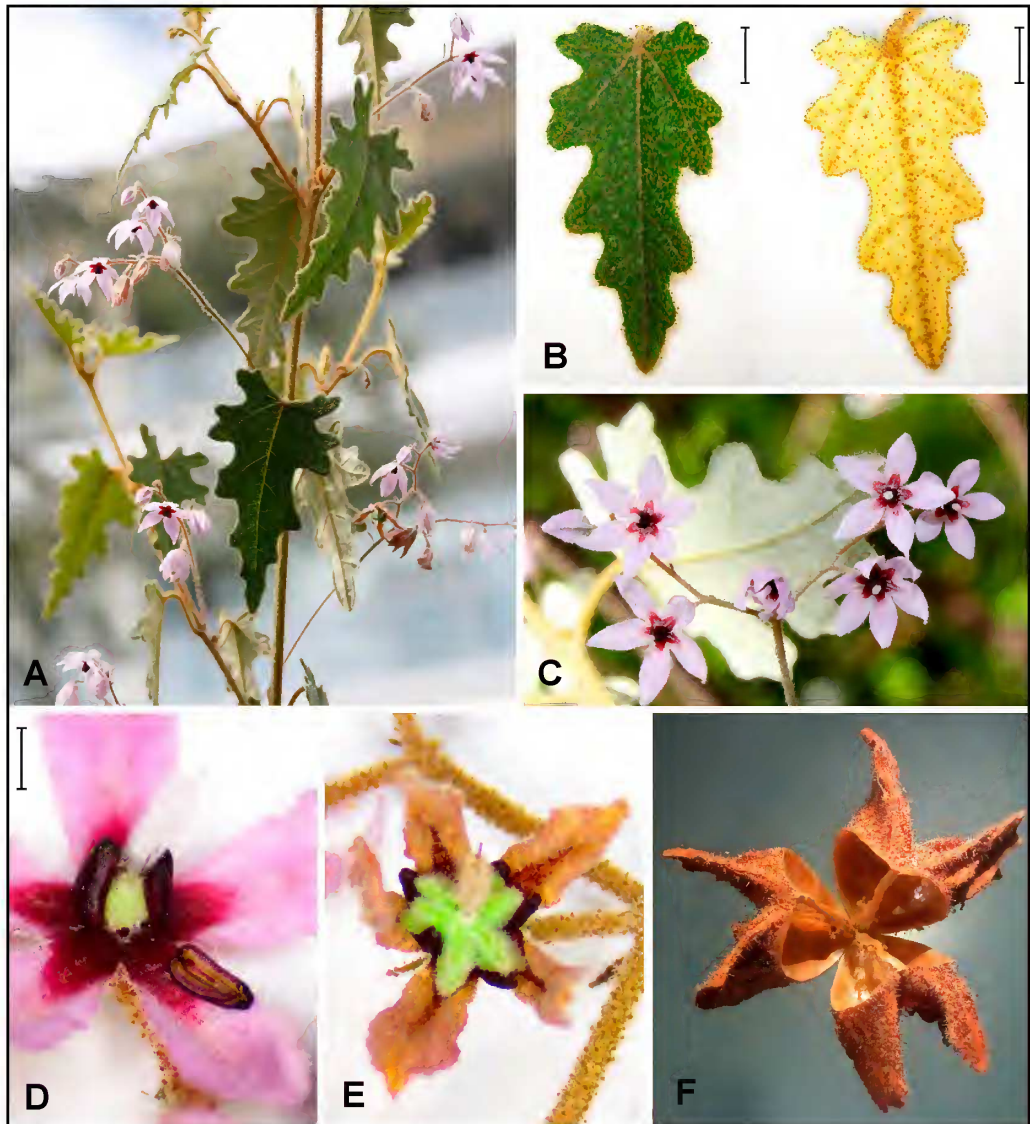


Figure 10. *Lasiopetalum pterocarpum*. A – habit; B – distinctly discolorous leaves with multilobed margins, adaxial surface (left) with scattered to moderately dense, white and tan-centred, stellate hairs, and abaxial surface (right) with scattered, ferruginous, stellate hairs over a tomentum of white, stellate hairs; C – a loose, dichasial inflorescence of pale pink flowers, showing elliptic calyx lobes with a red patch at the base; D – flower with an anther pulled away to show the pale green ovary covered in white, stellate hairs; E – immature green fruit developing six distinctive wings; F – 3-locular fruit with wings, showing scattered, stalked, clavate, glandular hairs as well as stellate hairs on the outer surface. Scale bars = 10 mm (B); 1.5 mm (D). Voucher: plant grown in cultivation in the grounds of the Department of Biodiversity, Conservation and Attractions' Keiran McNamara Conservation Science Centre, Kensington. Images by K.A. Shepherd.

Lasiopetalum pterocarpum also has larger flowers and seeds than *L. floribundum* (see Figure 4D in Shepherd *et al.* 2006).

Notes. While some species of *Seringia* J.Gay (a genus also in the tribe *Lasiopetaleae*) may also have winged fruits (Wilkins & Chappill 2002b), the wings form along (rather than between) the lines of

dehiscence as seen in *L. pterocarpum*. The epidermal cell pattern on the seed exotesta is similar to that observed in *L. compactum* Paust and the aril belongs to subtype 3a of Wilkins and Chappill (2002b).

Lasiopetalum rutilans K.A. Sheph. & C.F. Wilkins, *sp. nov.*

Type: Mount Lesueur National Park, Western Australia [precise locality withheld for conservation reasons], 23 August 2016, *K.A. Shepherd & C.F. Wilkins* KS 1601 (*holo:* PERTH 08858128; *iso:* BRI, CANB, K, MEL, NSW).

Lasiopetalum sp. Mount Lesueur (E.A. Griffin 1997), Western Australian Herbarium, in *FloraBase*, <https://florabase.dpaw.wa.gov.au/> [accessed 30 August 2016].

Erect, rounded *shrub* 0.4–1.8 m high, 1.5–1.8 m wide. *Young stems* with moderately dense, red, stellate hairs, mainly sessile or with a stalk to 0.3 mm long and 8–12 arms, each to 1.5 mm long, and occasional glandular hairs to 0.8 mm long, with or without occasional, small, white, stellate hairs and red glands to 0.1 mm long; mature stems red-brown, glabrescent. *Petioles* 3.3–14.5 mm long, indumentum as for young stems. *Mature leafblades* soft, ovate, scarcely discoloured, 8–28 mm long, 6–22 mm wide, base cordate, apex acute; margin entire to sinuate, flat or scarcely recurved; abaxial surface with scattered to moderately dense, tan-centred, white or red, stellate hairs with 8–12 arms, each 0.9–1 mm long, and occasionally with scattered glands to 0.1 mm long on midrib; adaxial surface with scattered to moderately dense, cream-brown, stellate hairs with 6–12 arms, each to 1.3 mm long, glandular hairs absent. *Inflorescence* a loose dichasium, 38–83 mm long, with 6–15 flowers; *peduncles* 19–57 mm long, with scattered, stalked (*c.* 0.2 mm long) or sessile, bright red, or pinkish-brown, stellate hairs with 8–10 arms, each to 1.8 mm long, over scattered, white, stellate hairs with *c.* 8 rarely rotate arms, each to 0.3 mm long and with or without occasional, glandular hairs to 1 mm long. *Pedicels* 3.5–9.8 mm long, indumentum as for peduncles. *Bract* narrowly ovate, 1.8–5.7 mm long, 0.35–0.7 mm wide. *Epicalyx* bract attachment 0.4–0.9 mm below the calyx, narrowly ovate, 0.8–2.5 mm long, 0.2–0.7 mm wide; abaxial surface and margin with occasional, white, stellate hairs with 6–8 arms, each to 1.5 mm long and with or without scattered, white, stellate hairs with *c.* 6 arms, each to 0.3 mm long; adaxial surface glabrous or with an occasional, white, stellate hairs with *c.* 6–10 arms, each to 0.3 mm long. *Calyx* pale pink, base dark red with green at the lobe junctions, 6.1–7.5 mm long, with a tube 0.7–1.2 mm long; lobes narrowly ovate, 6–6.1 mm long, (1.7–)2–2.8 mm wide, apex acute; outer surface with scattered, red, stellate hairs with *c.* 9–10 arms, each to 1.5 mm long at the base and margins, over white stellate hairs with *c.* 8 arms, each to 0.15 mm long, mainly towards base of the calyx or lobe margins only and with occasional glandular hairs to 0.8 mm long; inner surface glabrous. *Staminal filaments* 0.2–0.5 mm long, 0.15–0.2 mm wide. *Anthers* ovate, red-purple, 1.3–1.8 mm long, 0.7–0.8 mm wide. *Ovary* 0.8–1 mm long, 0.8–1 mm wide; outer surface with dense, white, stellate hairs to 0.15 mm long and scattered glandular hairs to 0.15 mm long. *Style* 2.5–4.8 mm long. *Fruit* an ellipsoid capsule, *c.* 4 mm long, *c.* 4 mm wide, with residual moderately dense, small, white, stellate hairs and scattered glandular hairs. *Seed* ellipsoid, dull, blackish brown with few stellate hairs, *c.* 2.6 mm long, *c.* 1.3 mm wide; aril a white cap with two arms, *c.* 1.3 mm long, *c.* 0.8 mm wide. (Figure 11)

Diagnostic features. *Lasiopetalum rutilans* is distinguished within the *L. floribundum* group by the presence of bright red, stellate hairs evident on new growth of the stem, outer surface of calyx, pedicels and peduncle, and in having broad calyx lobes (2–2.8 mm wide).

Selected specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 24 Dec. 1993, *B. Evans* WE 802 (PERTH); 16 Oct. 1946, *C.A. Gardner* 8468 (PERTH);



Figure 11. *Lasiopetalum rutilans*. A – habit; B – loose, dichasial inflorescence; C – ovate leaf, showing bright red, stellate hairs on new growth and scattered on the adaxial leaf surface; D – outer surface of calyx showing scattered, bright red, stellate hairs towards the base of each lobe, and red pedicel with stellate and glandular hairs; E – flowers showing the dark red base with green at the junction of each pink, petaloid, calyx lobe. Vouchers: *C.F. Wilkins & J.A. Wege* CW 2383 (A, D, E); *K.A. Shepherd & C.F. Wilkins* KS 1601 (B, C). Photographs by *J.A. Wege* (A, D, E) and *K.A. Shepherd* (B, C).

13 Sep. 1999, *M. Hislop* 1498 (PERTH); 26 Sep. 1976, *R.W. Johnson* 3289 (PERTH); 3 Nov. 1962, *R.D. Royce* 7713 (PERTH); 10 Sep. 2011, *K.R. Thiele* 4232 (PERTH); 16 Sep. 2010, *C.F. Wilkins & J.A. Wege* CW 2383 (PERTH).

Phenology. Recorded as flowering and fruiting from August to December.

Distribution and habitat. *Lasiopetalum rutilans* is restricted to a few populations within Mount Lesueur National Park, and scattered collections from unreserved lands between the town of Jurien Bay and Alexander Morrison National Park (Figure 7) in the Geraldton Sandplains bioregion (IBRA7; Department of the Environment 2013). It is found in open marri woodland or Kwongan heath on lateritic brown sand, white sand, or skeletal soil over sandstone, on upper slopes or valley floors.

Conservation status. *Lasiopetalum rutilans* is listed by Smith (2017) as Priority Two under Department of Parks and Wildlife Conservation Codes for Western Australian Flora, under the name *L. sp.* Mount Lesueur (E.A. Griffin 1997).

Etymology. The epithet is from the Latin *rutilans* (bright red), in reference to the distinctive colour of the stellate hairs evident on new leaf growth, peduncles and the outer surface of the calyx of this species (Figure 11).

Affinities. Refer to the comparative notes under the affinities section for *L. moullean* and *L. floribundum*.

Acknowledgements

The Western Australian Herbarium curator and staff are gratefully acknowledged for access to specimens and curatorial assistance. Assistance and companionship in the field provided by Fred and Jean Hort, the late John Wilkins, Spencer Willis and Juliet Wege was sincerely appreciated. Terry Macfarlane and Juliet Wege gave invaluable insight regarding typifications. Natalia Shiyani and Sergei Mosyakin kindly provided information on the Turczaninow collection at KW and the missing *Lasiopetalum* material collected by Gilbert, the latter also providing helpful comments in relation to the neotypification of *Corethrostylis parviflora*. Natasha Moore, Jazmin Lindley and Jenny Borger are thanked for their considerable efforts in surveying the granite outcrops in the Kellerberrin area and in the rediscovery of *L. moullean*. Natasha Moore is also credited with supplying information that led to the selection of the epithet for this species. Early stages of this study were undertaken by the lead author at the University of Western Australia, funded through an Australian Biological Resources Study grant awarded to the late Jenny Chappill and Eleanor Bennett; their contribution to this research is gratefully acknowledged. KAS also received a Winston Churchill Memorial Trust Fellowship, sponsored by the Australian Biological Resources Study. This fellowship facilitated travel to Europe to examine specimens lodged at BM, CGE, K, LD and W and these institutions and their staff are also gratefully acknowledged. Juliet Wege, Terry Macfarlane, Ryonen Butcher and the reviewer Laurie Haegi provided thoughtful and constructive comments that improved this paper.

References

- Bayer, C. & Kubitzki, K. (2002). Byttnerioideae. In: Kubitzki, K. & Bayer, C. (eds) *The families and genera of flowering plants, Vol. V (Flowering Plants. Dicotyledons: Malvales, Capparales and non-betulin Caryophyllales)*. pp. 241–247. (Springer-Verlag: Berlin.)
- Bennett, E.M. & Shepherd, K.A. (2007). *Lasiopetalum ferraricollinum* (Malvaceae s. lat.: *Lasiopetaleae*), a new species from the ironstone hills near Forrestania, Western Australia. *Nyctisia* 17: 67–72.

- Bentham, G. (1863). *Lasiopetalum*. *Flora Australiensis*. Vol. 1. pp. 259–266. (Reeve and Co.: London.)
- CHAH (Council of Heads of Australasian Herbaria) (2006–). *National Species List*. <https://biodiversity.org.au/nsl/services/apni> [accessed 19 September 2016].
- Chappill, J.A., Wilkins, C.F. & Crisp, M.D. (2007). Revision of *Jacksonia*. *Australian Systematic Botany* 20: 473–623.
- Chappill, J.A., Wilkins, C.F. & Crisp, M.D. (2008). Taxonomic revision of *Gompholobium*. *Australian Systematic Botany* 21: 67–151.
- Department of the Environment (2013). *Australia's bioregions (IBRA)*, IBRA7, Commonwealth of Australia. <http://www.environment.gov.au/land/nrs/science/ibra#ibra> [accessed 24 November 2015].
- Drummond, J. (1847). Correspondence. To the Editor of “The Inquirer”. *Inquirer* (Perth, Western Australia: 1840–1855) 3 November, p. 4.
- Grieve, B.J. (1998). *How to know Western Australian wildflowers*. Pt. 2. p. 623. (University of Western Australia Press: Crawley, Western Australia.)
- Harben, S. & Collard, L. (2008). *Avon Basin Noongar heritage and cultural significance of natural resources: literature review by Murdoch Project Team*. (Murdoch University: Perth.) [available at: https://www.wheatbelt.nrm.org.au/sites/default/files/knowledge_hub/documents/RTKlitweb.pdf]
- Hewson, H.J. (1988). *Plant indumentum: a handbook of terminology*. Bureau of Flora and Fauna, Canberra, Australian flora and fauna series, number 9. (Australian Government Publishing Service: Canberra.)
- Meissner, R.A., Rathbone, D.A. & Wilkins, C.F. (2014). *Lasiopetalum adenotrichum* (Malvaceae s. lat.), a new species from Fitzgerald River National Park. *Nuytsia* 24: 65–69.
- Paust, S. (1974). Taxonomic studies in *Thomasia* and *Lasiopetalum* (Sterculiaceae). *Nuytsia* 1: 348–366.
- Rudge, E. (1811). A description of several species of plants from New Holland. *Transactions of the Linnean Society of London* 10(2): 297, t. 19.
- Shepherd, K.A., Bennett, E.M., Wilkins, C.F. & Sage, L.W. (2006). *Lasiopetalum pterocarpum* (Malvaceae s.l.: Lasiopetaleae), a new and rare species from south-west Western Australia. *Nuytsia* 16(1): 175–181.
- Shepherd, K.A. & Wilkins, C.F. (2015). A revision of species from the tribe *Lasiopetaleae* (Byttnerioideae: Malvaceae) with rostrate anthers. *Nuytsia* 25: 171–189.
- Smith, M. (2017). *Threatened and Priority Flora list for Western Australia*. (Department of Parks and Wildlife: Kensington, Western Australia.)
- Stevens, P.F. (2001–). *Angiosperm Phylogeny Website*. Version 12, July 2012. <http://www.mobot.org/MOBOT/research/APweb/> [accessed 19 September 2016].
- Turczaninow, N.S. (1847). *Corethrostylis parviflora*. *Bulletin de la Société impériale des naturalistes de Moscou* 20(1): 174.
- Western Australian Herbarium (1998–). *FloraBase—the Western Australian Flora*. Department of Parks and Wildlife. <https://florabase.dpaw.wa.gov.au/> [accessed 24 November 2015].
- Whitlock, B.A., Bayer, C. & Baum, D.A. (2001). Phylogenetic relationships and floral evolution of the Byttnerioideae (“Sterculiaceae” or Malvaceae s.l.) based on sequences of the chloroplast gene, *ndhF*. *Systematic Botany* 26(2): 420–437.
- Whitlock, B.A., Hale, A.M., Indorf, J.L. & Wilkins, C.F. (2011). Polyphyly in *Rulingia* and *Commersonia* (Lasiopetaleae, Malvaceae s.l.). *Australian Systematic Botany* 24: 215–225.
- Wilkins, C.F. (1999). *Keraudrenia exastia* and *Keraudrenia katatona* (Malvaceae: Byttnerioideae), new species from the Kimberley region of Western Australia. *Nuytsia* 13(1): 233–242.
- Wilkins, C.F. (2005). *Rulingia borealis*, a new combination based on *R. malvifolia* var. *borealis* (Malvaceae s.l. or Sterculiaceae). *Nuytsia* 15(3): 517–522.
- Wilkins, C.F. & Chappill, J.A. (2001a). A taxonomic revision of the Western Australian genus *Lysiosepalum* (Malvaceae: Lasiopetaleae). *Nuytsia* 13(3): 571–594.
- Wilkins, C.F. & Chappill, J.A. (2001b). Taxonomic Revision of *Hannafordia* (Lasiopetaleae: Sterculiaceae (Malvaceae s.l.)). *Australian Systematic Botany* 14: 101–124.
- Wilkins, C.F. & Chappill, J.A. (2002a). New chromosome numbers in *Lasiopetaleae*. *Australian Systematic Botany* 15: 1–8.
- Wilkins, C.F. & Chappill, J.A. (2002b). Seed and seedling morphology and seed anatomy of *Lasiopetaleae* (Malvaceae s.l. or Sterculiaceae). *Australian Systematic Botany* 15: 545–563.
- Wilkins, C.F. & Chappill, J.A. (2003). Taxonomic revision of *Guichenotia* (Malvaceae s.l. or Sterculiaceae). *Australian Systematic Botany* 16: 323–360.
- Wilkins, C.F. & Chappill, J.A. (2007a). Three new species of *Aotus* (Leguminosae: Mirbelieae) from south-western Australia. *Nuytsia* 17: 459–468.
- Wilkins, C.F. & Chappill, J.A. (2007b). Five new species of *Eutaxia* (Leguminosae: Mirbelieae) from south-western Australia. *Nuytsia* 17: 469–482.

- Wilkins, C.F. & Chappill, J.A. (2007c). Three new species of *Latrobea* (Leguminosae: Mirbeliaceae) from south-western Australia. *Nytsia* 17: 483–492.
- Wilkins, C.F., Chappill, J.A. & Henderson, G.R. (2010). An account of *Eutaxia* (Leguminosae: Mirbeliaceae) with a focus on the Western Australian species. *Nytsia* 20: 109–167.
- Wilkins, C.F., Copeland, L.M. & Whitlock, B.A. (2008). Two new species of *Commersonia* (Malvaceae *sensu lato*) from south-eastern Australia. *Telopea* 12(1): 59–69.
- Wilkins, C.F., Ladd, P.G., Vincent, B.J., Crawford, A.D. & Sage, L.W. (2009). Using hierarchies of cause to inform conservation of a naturally rare but critically endangered shrub *Lasiopetalum pterocarpum* (Malvaceae *s.l.*). *Australian Journal of Botany* 57: 414–424.
- Wilkins, C.F., Orthia, L.A. & Crisp, M.D. (2009). A new species of *Pultenaea* (Mirbeliaceae: Fabaceae) from Kundip, Western Australia. *Nytsia* 19(1): 191–196.
- Wilkins, C.F. & Trudgen, M.E. (2012). A new species of *Gompholobium* (Fabaceae: Mirbeliaceae) from the Pilbara bioregion of Western Australia. *Nytsia* 22(1): 31–40.
- Wilkins, C.F. & Whitlock, B.A. (2005). A new species of *Commersonia* (Malvaceae *s.l.*), from the Eyre Peninsula, South Australia. *Muelleria* 22: 88–92.
- Wilkins, C.F. & Whitlock, B.A. (2009). *Guichenotia anota* and *Guichenotia apetala* (Lasiopetaleae: Byttneriaceae or Malvaceae *s.l.*) a new and a revised species endemic to the Ravensthorpe Range, south-west Western Australia. *Nytsia* 19(1): 181–190.
- Wilkins, C.F. & Whitlock, B.A. (2011a). A new Australian genus *Androcalva* separated from *Commersonia* (Malvaceae *s.l.* or Byttneriaceae). *Australian Systematic Botany* 24(5): 284–349.
- Wilkins, C.F. & Whitlock, B.A. (2011b). Revision of *Commersonia* including *Rulingia* (Malvaceae *s.l.* or Byttneriaceae). *Australian Systematic Botany* 24(5): 226–283.
- Wilkins, C.F. & Whitlock, B.A. (2015). *Seringia* revised to include *Keraudrenia* (Lasiopetaleae: Malvaceae *s.l.*). *Australian Systematic Botany* 28: 265–365.
- Wilson, W.H. (1981). *Bushman born*. (Artlook Books Trust: Perth.)